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A Sociocognitive Perspective of the Uncanny Valley

Andre Zamani
azamani@pugetsound.edu

A SOCIOCOGNITIVE PERSPECTIVE OF THE UNCANNY VALLEY

Andre Zamani, David Andresen, & Erin Colbert-White
University of Puget Sound

BACKGROUND

Uncanny Valley

- According to Mori's theory [1], one's affinity for an object increases linearly with the object's human likeness until the object is nearly human. At this point, the object enters the *uncanny valley* where affinity drops substantially and 'eeriness' is reported.
- Some hypotheses explain the eerie feeling as being due to a violation of expectation of full humanness, an inability to accurately label an object as human or not, and mismatching morphological features (e.g., nonhuman eyes with human face structure) [2].

Oxytocin

- Oxytocin is an endogenous neuropeptide that is known to increase the salience of social information regardless of whether it is positive or aversive [3].
- While there are numerous studies exploring oxytocin's effects on attention to positive social information, less is known about its effects on attending to negative or aversive social information.

CURRENT STUDY

Using a social neuroscience framework, our goal was to investigate if objects in the uncanny valley are processed as social information at any point along their cognition. To accomplish this, we increased participants' internal levels of oxytocin while they viewed faces with varying degrees of human likeness. Last summer we found that increasing participants' internal levels of oxytocin didn't change how eerie they perceived a face to be, but did make them quicker to provide a rating. For the current study, we included eye-tracking so as to understand whether the change in reaction time was due to oxytocin's effect on attentional mechanisms (thereby affecting eye movements), decision making, or both.

METHOD

Participants

- 40 undergraduates (M_{age} = 20.9 years), without female reproductive organs.

Oxytocin Administration & Eye-tracking

- Participants randomly self-administered a placebo nasal spray in one session and an oxytocin (40 IU) nasal spray in another.
- Eye-tracking bar mounted underneath the computer monitor tracked participants' pupil behaviors.

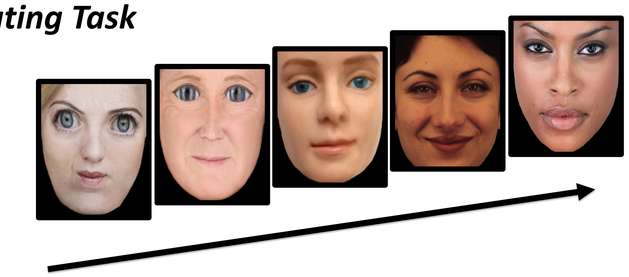
Morph Stimuli

- 18 nonhuman-to-human face morphs (*n*s = 6 androids, cartoons, and dolls) were constructed using Abrosoft Fantamorph (v. 5) [4]. 9 morphs were seen per session.
- Morphs were divided into still images based on their percent humanness.

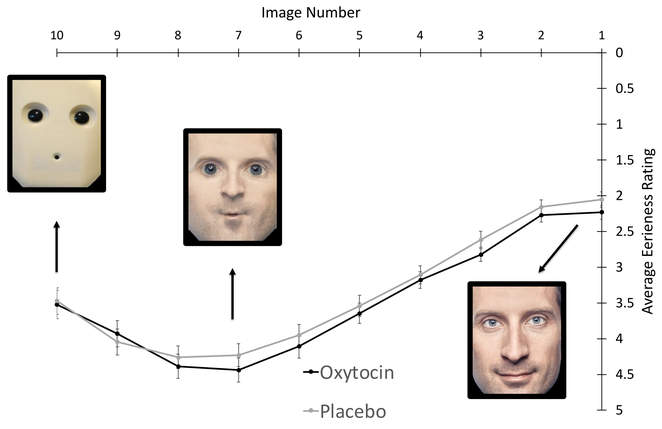
TASK

Eeriness Rating Task

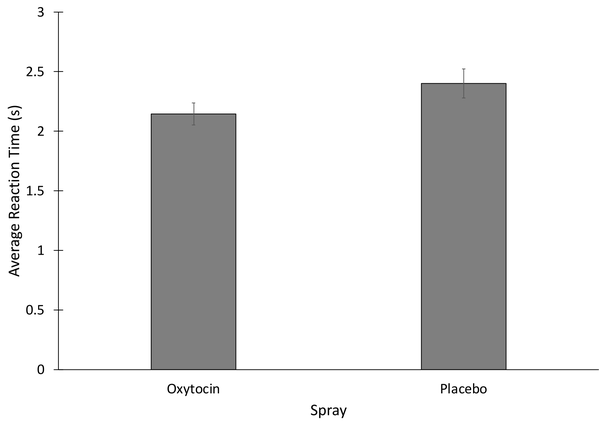
- 90 randomly-presented images comprised of 9 morphs divided into 10 images each (10% increments of humanness)
- Using a keyboard, participants rated each image on a 7-point scale, where 1 was "least eerie" and 7 was "most eerie"
- Participants' eyes were tracked during the task



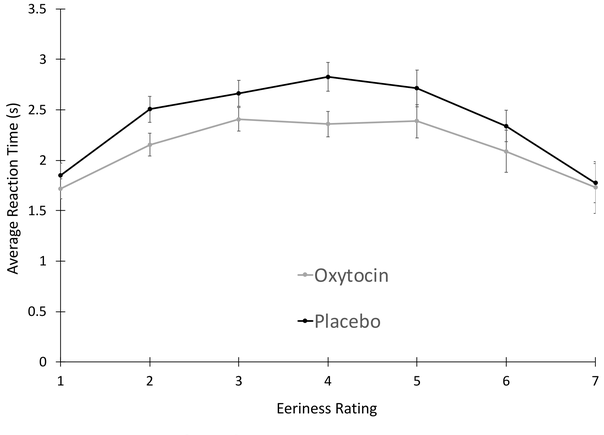
RESULTS



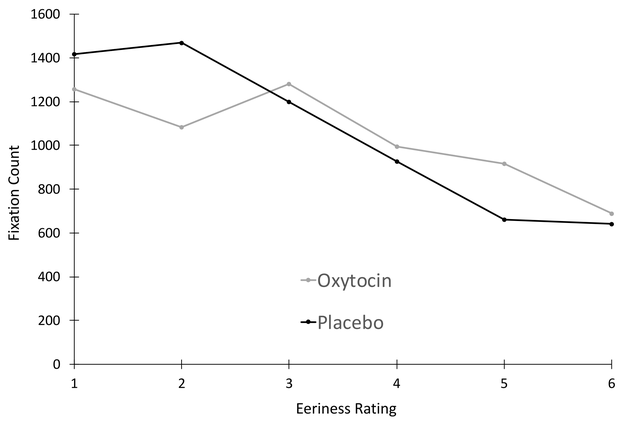
- ***Uncanny valley observed at images 7 and 8***
- ***Oxytocin did not significantly affect eeriness ratings (p = .162)***



- ***Oxytocin significantly decreased reaction times for making an eeriness rating (p = .012)***



- ***Oxytocin's reduction in reaction time was enhanced for stimuli rated to be intermediately eerie, and diminished for stimuli rated to be not eerie or very eerie***



- ***Oxytocin reduced fixations for stimuli rated to be not very eerie, but somewhat increased fixations for stimuli rated to be eerie***

DISCUSSION

Intranasal oxytocin significantly decreased participants' reaction times when deciding upon eeriness ratings, and this effect was most marked for faces rated as being intermediately eerie. Contrasting this, oxytocin's effect on visual attention was the most pronounced for faces rated to be not eerie or very eerie. Thus, oxytocin affected decision making for objects with ambiguous animacy, and visual attention towards those with les ambiguous animacy.

This suggests first, that uncanny objects are processed as social information along different points of cognition, namely during decision making and early visual attention. Second, our findings implicate oxytocin as a molecule that not only affects the salience of social information [3], but also how decisions are made with regards to it.

A limitation of our experiment is the restricted dynamism of our face stimuli. While we found that oxytocin didn't affect peoples' ratings of eeriness, it is possible that when engaging with more complicated social stimuli, different levels of oxytocin differentially affect conclusions.

FUTURE DIRECTIONS

To further investigate the uncanny valley's sociocognitive underpinnings and oxytocin's role in social cognition, future research should:

- Create more dynamic stimuli (e.g. with movement or voice) to investigate if oxytocin can lead to different interpretations of eerie social stimuli when more information is present
- Investigate oxytocin's effects on the cognition of social information which is ambiguous along a dimension other than animacy
- Diversify the participant sample

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